

Gas Leakage Detection System Using Microcontroller

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Abstract: This Gas detection system is a very important process in industrial and domestic applications. A gas detector detects different combustible gas in an area, usually as a part of safety system. Gas leakage can seriously affect the performance of an industrial process. A gas detection system can also sound as an alarm in an area where the leak is happening and can give warning signals to the operators.

The gas detection system comprises of a sensing element, which senses the gas and converts it into voltage using a bridge circuit. This voltage is then given to a microcontroller circuit. According to the inbuilt program the microcontroller sends an alarm message to the selected phone numbers regarding the leakage. There is also a buzzer alarm system which makes a beep sound when the gas is leaked. A fan works on the basis of the signal and sucks out the combustible gases.

Keywords: GSM(Global system for mobile communication), LPG(Liquified petroleum gas), Gas sensor MQ5, Timer IC555, Microcontroller AT89S51, Alarm(buzzer), Exhaust fan(12V DC).

I. INTRODUCTION

The use of LPG and natural gas in energy sector is rapidly increasing day by day because of its properties like high calorific value produce low smoke and less soot. These days LPG is most widely used in automobiles, homes and industries. The LPG or natural gas is flammable mixture of hydrocarbon gases like propane, butane. Due to this properties of LPG or natural gas, the leakage of these gases is a serious concern, as it results in to serious threats to living beings. The world wide LPG Gas or natural gas is transported by the cylinders and high pressurized gas pipe lines. According to the study presented in, gas pipe lines are safe but they are prone for gas leakage due to mishandling, accidents and ageing factor. To avoid these situations a number of efforts have been devoted to develop a reliable technique for detecting gas leakage. A survey on these techniques has been done in.

For pipe encased gas pressure label line a study on the existing method of gas leakage has been done in and adopted a method from the existing methods which consist of three steps but these steps are totally dependent on the structure and joint of the pipe.

2. BLOCK DIAGRAM

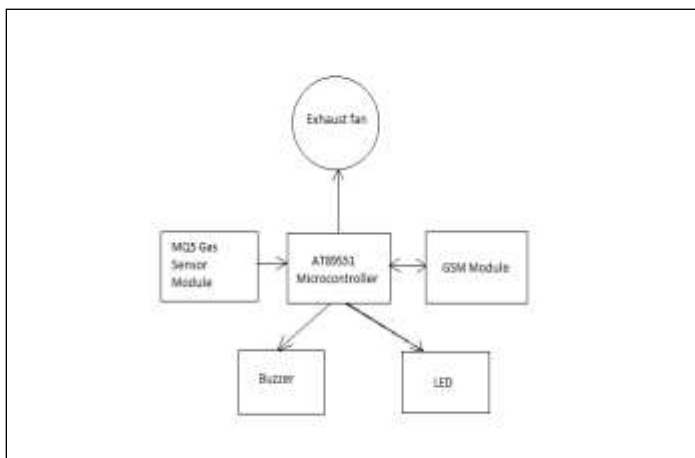


Fig 1. Block diagram of gas leakage detector

Block Diagram Description

Microcontroller

It is the heart of the system. It is used to control the Exhaust fan, LED and Buzzer when LPG leakage occurs. Both the input and output ports of the microcontroller are used for this purpose.

MQ5 Gas Sensor

This sensor is used to sense the leakage of LPG. In normal conditions the output of this sensor is ‘high’ and it goes ‘low’, when the LPG is sensed.

Exhaust Fan

The LPG is pushed out to the environment using an exhaust fan which reduces the concentration of LPG from the leakage area.

Buzzer

The leakage of the LPG is indicated by using the buzzer. It is 5 V DC operated buzzer.

LED

The leakage of the LPG is indicated by using the LED. It is 1.2 V DC operated LED

3. Model Configuration and Working

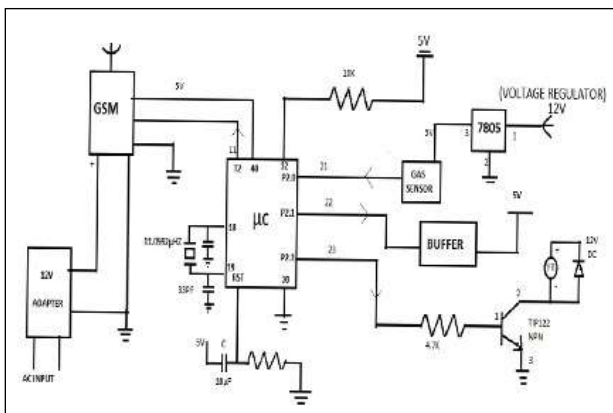


Fig 2. Circuit diagram of gas leakage detector

When target LPG gas or combustible gases exist in the environment the conductivity of the gas sensor increases. When using MQ5 gas sensor, sensitivity is very necessary. We calibrate the detector for 1000ppm H₂ and LPG concentration in air and uses load resistance (RL) about 20 kΩ. When the target combustible gas exists in the environment, the sensor’s conductivity increases, and resistance of sensor changes with the concentration of combustible gases. A simple electronic circuit can be used to convert the change in resistance to change in terms of concentration of combustible gases. The sensor works with 5 volt power supply.

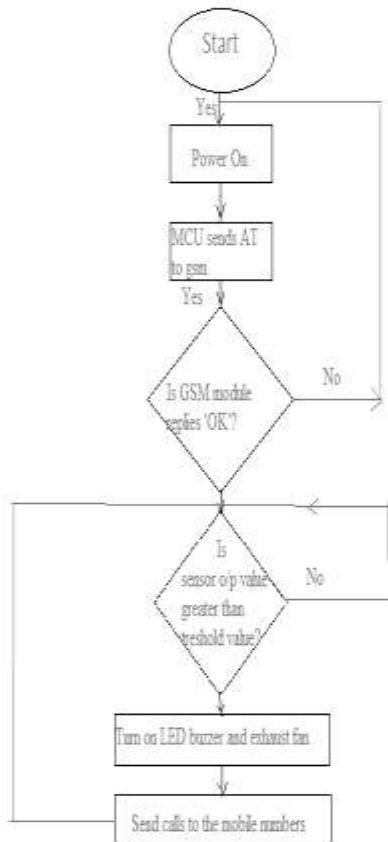


Fig 4: Flow chart diagram of gas leakage detector

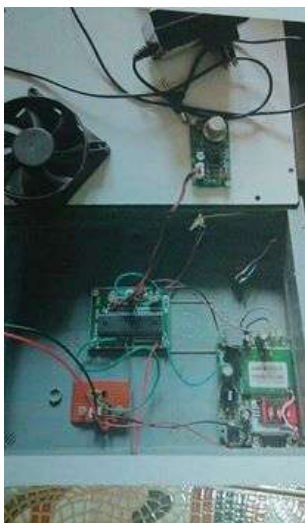


Fig3: Working model of a LPG leakage detector

4. Results and Discussions

Obtained the output of LPG gas leakage detection system properly. When gas leakage is detected by the MQ5 sensor, the microcontroller switched on the fan GSM module and buzzer using microcontroller and provided necessary security. Gas leakage security system comprises of sensitive sensor, GSM module and RF links which are cost effective and consumes less power with low maintenance. The sensitivity of the sensor is high and it gives very fast response, accurate detection and provides necessary security to the user

The system can be further enhanced by using PIC microcontroller in place Atmel microcontroller which supports real time application and real time clock to display the date and time of the gas leakage. The system can also be modified using a temperature sensor that detects sudden rise in temperature due to other causes which can be hazardous. The temperature sensor can also use to detect the temperature near the high pressure gas pipes, display it and also alert when high temperature is reached.

5. Conclusion

We have finally succeeded in making the "Gas leakage detection system using microcontroller" satisfactorily. More knowledge is gained and more experiences are faced lot of information are collected ultimately, we have concluded with a great pleasure for achieving our aim.

We have planned to fulfil our technical requirements. The knowledge we have attained with this project really would follow till the end of our career.

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